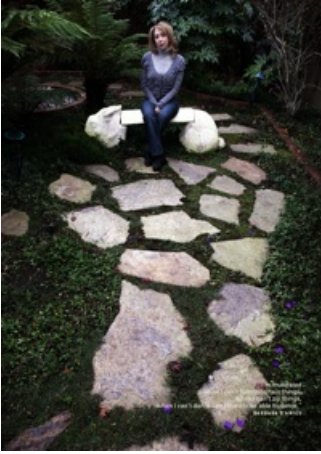


## Stories of Hope: Arthritis



Six days a week, **Barbara D'Amico** hits the gym. "I do intensive workouts. I do weights. I do aerobics. That's my part-time job, to stay healthy," D'Amico said.

She's fighting rheumatoid arthritis. The Redwood City accountant has had the degenerative disease more than 40 years. She can make it seem like a snap; it's anything but.

"There are challenges every day — getting up, starting my day. I'm frustrated when I can't button certain things, when I can't zip things, when I can't dance like I used to be able to dance. But I still do my aerobics. I push myself. I challenge myself," D'Amico says.

Today, the drug Orencia holds her disease at bay. "It's the best medicine I've ever had," she said. But when she was first diagnosed, doctors had little to offer. They told her to take it easy. "

I really didn't listen to the doctor. It's probably the best thing I ever did."

Seeing the way therapies have improved makes her hopeful for a future stem cell-derived treatment to restore the damage done by arthritis.

"I think in the long run it will help people and correct the deformity of the disease," she said. "The problem is, now, they can't reverse it."

- Watch the Spotlight on Arthritis talks

## CURING ARTHRITIS

**They're like biological M&Ms — only very, very small ones — designed to treat Arthritis.** A shell of juvenile cartilage cells wrap a center formed of stem cells plucked from bone marrow.

Together, they may hold a key to repairing the early degradative changes of arthritis, according to Jeffrey Lotz, Ph.D., director of the Orthopaedic Bioengineering Laboratory at the University of California, San Francisco.

Medicine has little to offer the 16 million Americans with osteoarthritis beyond pain treatment and joint replacement. When a combination of genetic propensity and injury to cartilage kicks off the changes that lead to arthritis, there is no way to halt it. Arthritis can also be triggered by joint infection, aging or gout.

It's not a simple problem, Lotz said. Lack of adequate cartilage stem cells led Lotz to turn to the undifferentiated mesenchymal stem cells found in bone marrow. Then the question became how to make these cells — which can turn into fat, bone, cartilage or skin — into cartilage. Thus the M&M idea arose. The sheath of juvenile chondrocytes — cartilage cells — act like guides, sending signals that tell the stem cells, Hey, we're supposed to become cartilage.

The pellets are mixed in a biomaterial, like M&Ms in Jell-O, Lotz said, and put into damaged cartilage, where they grow into new tissue.

In tissue culture and tests in rabbits, the cells functioned according to plan. Whether they will work to replace native cartilage in weight-bearing joints awaits testing in larger animals.

William Robinson, M.D., Ph.D., assistant professor of immunology and rheumatology at Stanford University, looks at the other side of the arthritis problem.

"You have to treat the underlying pathogenic process to have successful stem cell therapy," Robinson said. "If the inflammatory process in the joint isn't attenuated, it doesn't matter what else you do."

By comparing gene expression patterns in synovial fluid from around the knees of people with and without arthritis, he confirmed that arthritis sufferers have a higher level of complement effector proteins. Complement proteins are part of the body's immune defense. When activated by antibodies, they destroy invaders. But in arthritis, they attack chondrocytes.

In animal studies, Robinson found that joint damage routinely turned into severe osteoarthritis in normal mice. But mice deficient in complement healed without arthritis.

"Inflammation and complement are playing a prominent role in degenerative arthritis," Robinson said. "If you want to be successful, in terms of slowing its progression and regenerating tissue, you're going to need to control that."

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